MONKEYPOX

Monkeypox Response Update

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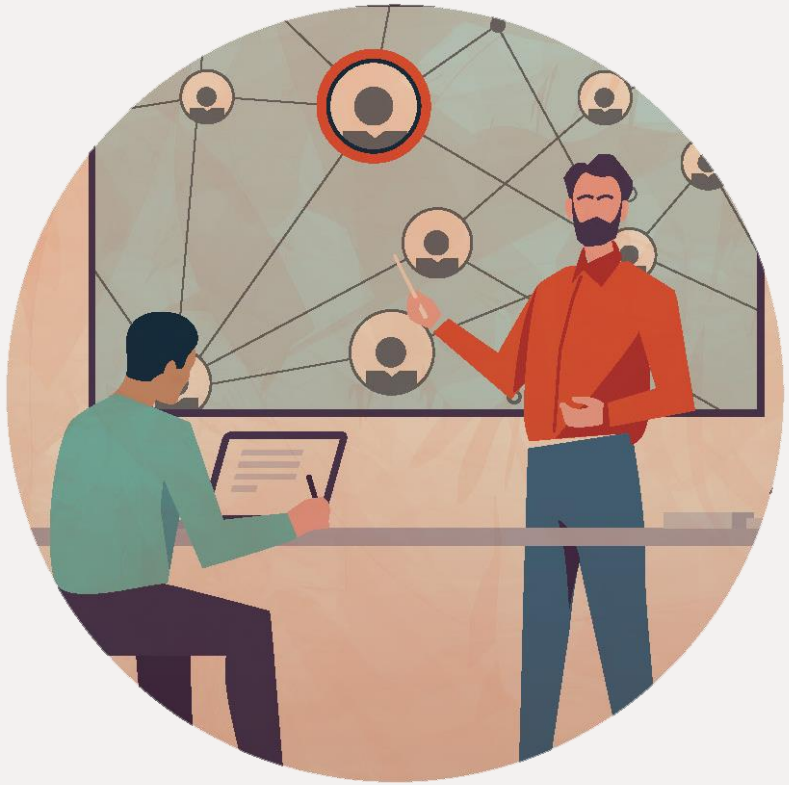
Opportunities for Monkeypox Vaccine Effectiveness Studies – United States



Elissa Meites, MD, MPH

Centers for Disease Control and Prevention

World Health Organization R&D Meeting

August 2, 2022

https://www.cdc.gov/poxvirus/monkeypox/response/2022/index

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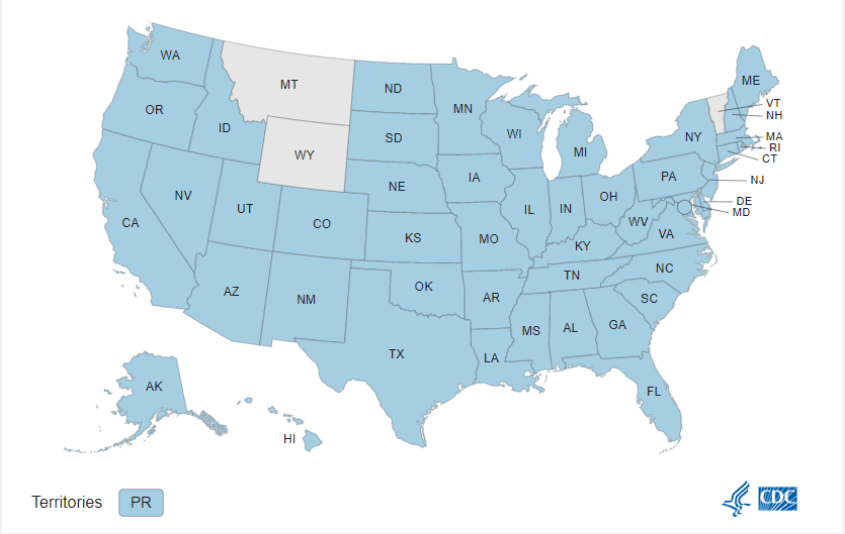
Monkeypox infections – United States, 2022

- As of August 1, total confirmed monkeypox/orthopoxvirus cases: **5,811**
- Most (99%) male sex at birth
- Median age 35 years, range 2–78 years
- Most (97%) reported recent male-male sexual contact
- Most common symptom rash (99%)



U.S. states reporting most cases:

State	Case Count
New York	1,390
California	827
Illinois	520
Florida	442

https://www.cdc.gov/poxvirus/monkeypox/response/2022/us-map.html

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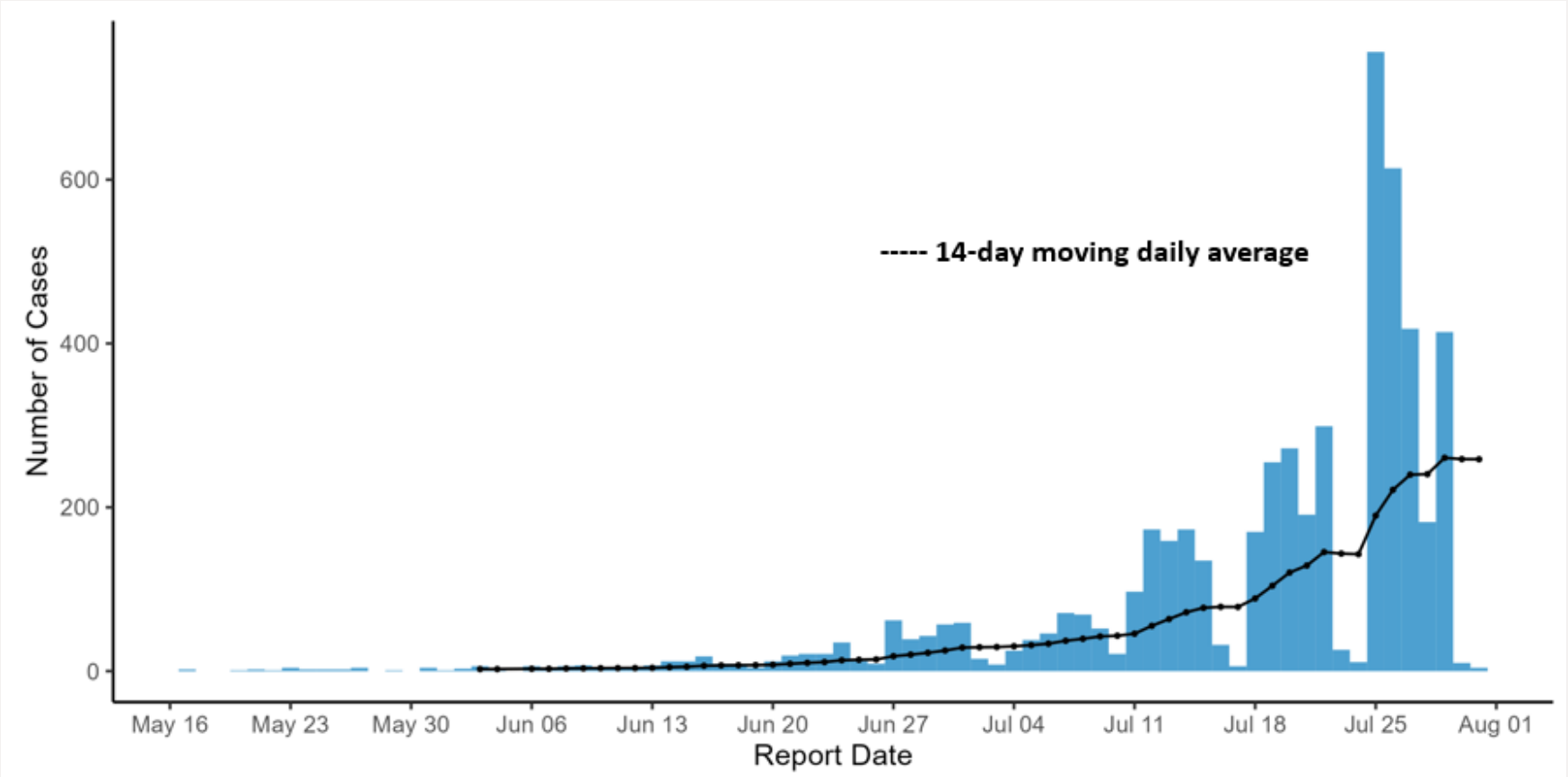
Monkeypox infections – United States, 2022



* Includes either the positive laboratory test report date, CDC call center reporting date, or case data entry date into CDC's emergency response common operating platform, DCIPHER.

https://www.cdc.gov/poxvirus/monkeypox/response/2022/mpx-trends.html

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Timeline of response activities

- May 17, 2022: First U.S. case reported
- May 17, 2022: CDC emergency response structure initiated
- May 20, 2022: Health Alert Network (HAN) released
- June 10, 2022: *MMWR* outbreak report published
- June 28, 2022: National vaccination strategy announced
- July 27, 2022: >1 million vaccine doses allocated

https://www.cdc.gov/poxvirus/monkeypox/clinicians/technical-report.html
https://emergency.cdc.gov/han/2022/han00466.asp
https://www.cdc.gov/mmwr/volumes/71/wr/mm7123e1.htm

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National vaccination strategy

- Vaccinates people at risk for monkeypox
- Prioritizes vaccines for areas with highest numbers of cases and at-risk populations
- Provides guidance to state, territorial, tribal, and local health officials
- Post-exposure in addition to pre-exposure strategies
- No data yet available on real-world effectiveness of these vaccines in the current outbreak

https://www.hhs.gov/about/news/2022/06/28/hhs-announces-enhanced-strategy-vaccinate-protect-at-risk-individuals-from-current-monkeypox-outbreak.html

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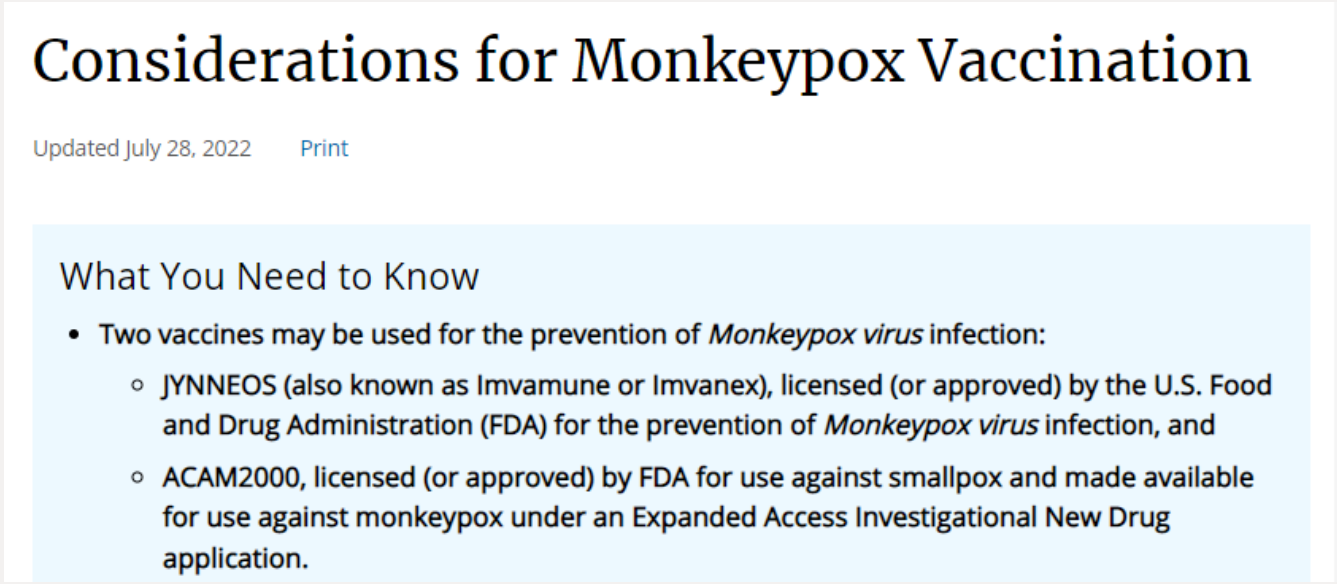
U.S. vaccination recommendations

- JYNNEOS is recommended as a series of 2 doses given 28 days apart
- Some U.S. jurisdictions have announced plans to extend this dosing interval in the context of limited vaccine supply
- ACAM2000 also available



Considerations for Monkeypox Vaccination

Updated July 28, 2022 Print

What You Need to Know

- Two vaccines may be used for the prevention of *Monkeypox virus* infection:
  - JYNNEOS (also known as Imvamune or Imvanex), licensed (or approved) by the U.S. Food and Drug Administration (FDA) for the prevention of *Monkeypox virus* infection, and
  - ACAM2000, licensed (or approved) by FDA for use against smallpox and made available for use against monkeypox under an Expanded Access Investigational New Drug application.

https://www.cdc.gov/poxvirus/monkeypox/considerations-for-monkeypox-vaccination.html

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Post-exposure prophylaxis (PEP)

- People can be vaccinated **after** exposure
- CDC recommends initiating vaccination within 4 days; if initiated 4–14 days after exposure, vaccination may be less effective
- People who receive a first vaccine dose should take precautions to reduce their exposure to monkeypox until 14 days after a second vaccine dose is given, when peak immunity is expected
- People who get vaccinated should continue to take steps to protect themselves from infection

https://www.cdc.gov/poxvirus/monkeypox/considerations-for-monkeypox-vaccination.html

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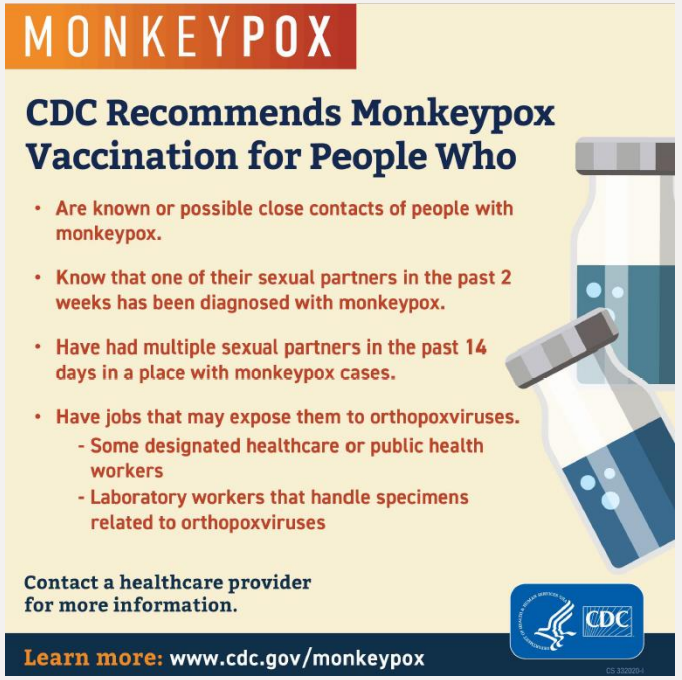
Expanded post-exposure prophylaxis (PEP++)

- People with certain risk factors are more likely to have been recently exposed to monkeypox, even without known exposure to confirmed case:
  - **Known** contacts who are identified by public health via case investigation, contact tracing, or risk exposure assessments
  - **Presumed** contacts who know that a sex partner in the past 14 days was diagnosed with monkeypox or who had multiple sex partners in the past 14 days in a jurisdiction with known monkeypox cases



https://www.cdc.gov/poxvirus/monkeypox/considerations-for-monkeypox-vaccination.html

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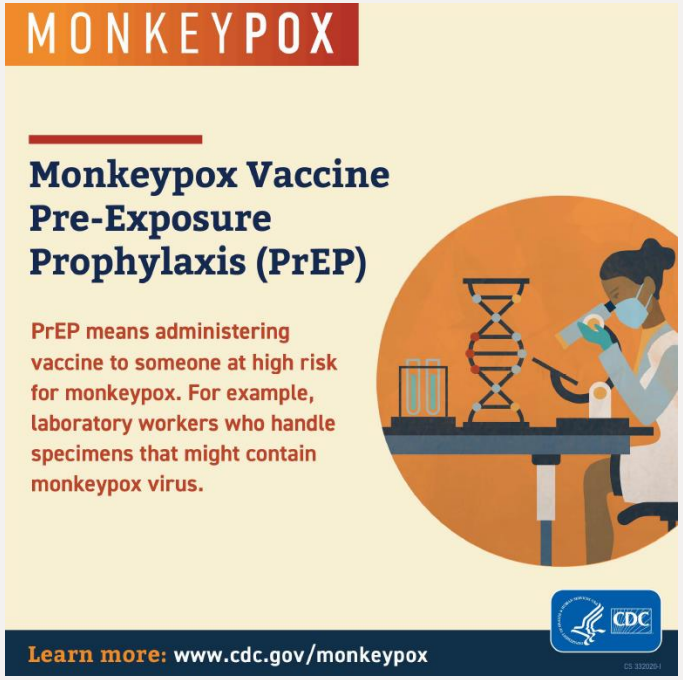
Pre-exposure prophylaxis (PrEP)

- Vaccination **before** exposure for someone at risk
  - Research laboratory personnel working with orthopoxviruses
  - Clinical laboratory personnel performing diagnostic testing for orthopoxviruses
  - Designated orthopoxvirus and health care worker response teams
- CDC guidance on the introduction of PrEP strategies might be updated in the future



https://www.cdc.gov/mmwr/volumes/71/wr/mm7122e1.htm
https://www.cdc.gov/mmwr/volumes/65/wr/mm6510a2.htm

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U.S. research priorities

Monkeypox Research Area	Research Priorities
Effectiveness, safety, and equitable distribution of vaccines and therapeutics	Vaccine effectiveness (pre- and post- exposure)
	Therapeutic effectiveness (post-exposure prophylaxis and treatment)
	Comparing effectiveness and safety of one vs. two dose vaccine and other dose sparing regimens
	Studies in special populations such as immunosuppressed, pregnant, and pediatric populations
Novel methods for evaluating medical countermeasure and diagnostic effectiveness	Decentralized trials, remote case monitoring, and improved access to interventions

https://www.whitehouse.gov/ostp/news-updates/2022/07/21/u-s-monkeypox-research-priorities-speeding-science-for-impact/

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What CDC is Doing

CDC activities

- Case identification and contact tracing
- Testing and case confirmation
- Investigating to better understand the outbreak and inform response
- Global coordination
- Outreach to clinicians including clinical consultations
- Raising awareness among partners, disproportionately affected communities, and the public
- Infection prevention and control
- Improving access to vaccines and therapeutics

https://www.cdc.gov/poxvirus/monkeypox/response/2022/cdc-response.html

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Sources of vaccine effectiveness (VE) data

- Data on cases of monkeypox, persons tested, and vaccines administered could be used to assess VE:
  - Contact tracing efforts
  - Persons tested for monkeypox
  - Follow-up of vaccine recipients
  - Retrospective case data (e.g., deidentified line list)
  - Vaccine doses administered
- Data collected from multiple jurisdictions using common variables and formats may be combined to increase sample sizes for estimation of VE by dose and for risk groups.

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Technical assistance

Type	Investigation	Collaborating Institutions	Status
Technical Assistance	3-4 week technical assistance to improve understanding of monkeypox cases through network analysis and characterizing transmission dynamics, including processing through detailed partner services/contact tracing data to better understand secondary attack rates, delays between exposure and symptom onset, characterization exposure types, and identifying common venues associated with transmission.	CDC, DC Department of Health	Ongoing virtually since Tuesday, July 12

https://www.cdc.gov/poxvirus/monkeypox/clinicians/technical-report.html

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VE variables of interest

- **Case data**
  - Demographics (age, race/ethnicity)
  - Sex at birth and gender identity
  - Sex of recent sex partners
  - Underlying medical conditions (HIV)
  - Exposures and risk behavior
  - Vaccination status (product, doses, dates)
  - Infection status
  - Clinical outcomes
  - Other treatments received
- **Vaccination data**
  - Demographics (age, race/ethnicity)
  - Sex at birth and gender identity
  - Vaccines given (product, doses, dates)
  - Vaccination strategy: PEP, PEP++, PrEP

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CDC collaborations

- Existing surveillance systems engaging men who have sex with men and transgender women:
  - National HIV Behavioral Surveillance (NHBS)
  - STD Surveillance Network (SSuN)
  - Strengthening the Response to Resistant Gonorrhea (SURRG)
  - Gonococcal Isolate Surveillance Project (GISP)
  - Network Epidemiology of Syphilis Transmission (NEST)
  - Surveillance for Anal HPV among men (SAM)

https://www.cdc.gov/hiv/statistics/systems/nhbs/index.html
https://www.cdc.gov/std/ssun/default.htm
https://www.cdc.gov/std/gisp/default.htm
https://www.cdc.gov/std/gonorrhea/arg/carb.htm

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Discussion

- Standardized protocols
- Defined clinical endpoints
  - Infection (reinfection?) status
  - Symptoms of interest (rash, proctitis, time to symptom resolution)
  - Severe outcomes (hospitalizations, deaths)
- Analytic approaches
  - Test-negative design

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Acknowledgments

- U.S. Department of Health and Human Services (HHS)
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  - Stephen Flores
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  - Brett Petersen
  - Agam Rao
  - Inger Damon

For more information, contact CDC

1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

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Vaccine planning considerations

- **Consider the following approaches to ensure equitable vaccine distribution:**
  - Engage people from affected communities in planning for vaccine programs and as trusted sources of information about monkeypox and vaccination
  - Use non-stigmatizing, plain language
  - Reiterate privacy of information and how data will be used
  - Engage diverse partners already working with special populations
  - Bring vaccines to where people are through pop-up events and mobile outreach
  - Leverage clinical venues that serve people who have historically had less access to primary care, including sexual health clinics, transgender health clinics, and pharmacies

https://www.cdc.gov/poxvirus/monkeypox/considerations-for-monkeypox-vaccination.html

$$VE = 1 - \frac{(Risk\ among\ vaccinated)}{(Risk\ among\ unvaccinated)}$$

VE methods

- In randomized studies, **vaccine efficacy** measures the reduction of risk, or attack rate, among vaccinated compared to unvaccinated persons.
- In observational studies, **vaccine effectiveness** can be estimated as a ratio of (1) disease incidence in the vaccinated population to incidence in the unvaccinated population, or (2) the odds of vaccination among persons with disease (cases) to the odds of vaccination among persons without disease (controls).
- VE is equal to the risk or odds ratio subtracted from 1 and multiplied by 100%.
- When vaccine coverage is known, disease incidence can be estimated by dividing vaccinated cases by vaccinated individuals, and unvaccinated cases by unvaccinated individuals from the same population during a specified time period.
- Estimating numbers of vaccinated and unvaccinated persons is challenging during rapid vaccine uptake. In the case-control approach, odds of vaccination (i.e., the ratio of vaccinated to unvaccinated individuals) is measured in a group of cases and a group of controls with similar characteristics.
- In a **test-negative design**, odds of vaccination may be compared among symptomatic individuals (for example, patients who present at an STI clinic) with positive test results for monkeypox (cases) vs patients who present at the same clinic with negative test results for monkeypox (controls).